WEST Search History

Hide Items | Restore | Clear | Cancel

DATE: Wednesday, September 28, 2005

Hide?	Set Name	Query	Hit Count
		DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ	
☐	L3	L2 and ((magnetic adj resonance) or MRI or NMR)	10
☐	L2	L1 and ((determin$4 or calculat$4 or find$3) with (magnetic with field with strength with phase with difference))	33
☐	L1	(magnetic with field with strength with phase with difference)	111

END OF SEARCH HISTORY

Hit List

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 33 of 33 returned.

☐ 1. Document ID: US 20040164737 A1

Using default format because multiple data bases are involved.

L2: Entry 1 of 33 File: PGPB Aug 26, 2004

PGPUB-DOCUMENT-NUMBER: 20040164737
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040164737 A1

TITLE: Method for determining the B1 field strength in MR measurements

PUBLICATION-DATE: August 26, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Feiweier, Thorsten	Poxdorf		DE	

US-CL-CURRENT: 324/309; 324/318

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. D

☐ 2. Document ID: US 20030152516 A1

L2: Entry 2 of 33 File: PGPB Aug 14, 2003

PGPUB-DOCUMENT-NUMBER: 20030152516
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030152516 A1

TITLE: Methods for imaging pulmonary and cardiac vasculature and evaluating blood flow using dissolved polarized 129Xe

PUBLICATION-DATE: August 14, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Driehuys, Bastiaan	Durham	NC	US	
Hasson, Kenton Christopher	Charlottesville	VA	US	
Bogorad, Paul Lev	New York	NY	US	

US-CL-CURRENT: 424/9.3

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 20020164925 A1

L2: Entry 3 of 33 File: PGPB Nov 7, 2002

PGPUB-DOCUMENT-NUMBER: 20020164925
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020164925 A1

TITLE: Integrated endpoint detection system with optical and eddy current monitoring

PUBLICATION-DATE: November 7, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Swedek, Boguslaw A.	San Jose	CA	US	
Birang, Manoocher	Los Gatos	CA	US	
Johansson, Nils	Los Gatos	CA	US	

US-CL-CURRENT: 451/5; 451/41, 451/59, 451/6, 451/8

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 4. Document ID: US 20020124634 A1

L2: Entry 4 of 33 File: PGPB Sep 12, 2002

PGPUB-DOCUMENT-NUMBER: 20020124634
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020124634 A1

TITLE: Method and arrangement for measuring characteristics of a non-newtonian fluid

PUBLICATION-DATE: September 12, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Litton, Jan-Eric	Stockholm		SE	

US-CL-CURRENT: 73/54.25; 73/54.24

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 5. Document ID: US 20020122183 A1

L2: Entry 5 of 33 File: PGPB Sep 5, 2002

PGPUB-DOCUMENT-NUMBER: 20020122183
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020122183 A1

TITLE: Sagnac interferometer current sensor

PUBLICATION-DATE: September 5, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Ohno, Aritaka	Tokyo		JP	
Usui, Ryuji	Tokyo		JP	
Terai, Kiyohisa	Kanagawa		JP	
Takahashi, Masao	Kanagawa		JP	
Sasaki, Kinichi	Kanagawa		JP	

US-CL-CURRENT: 356/483

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 6. Document ID: US 20020000801 A1

L2: Entry 6 of 33 File: PGPB Jan 3, 2002

PGPUB-DOCUMENT-NUMBER: 20020000801
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020000801 A1

TITLE: METHOD TO OBTAIN A TEMPERATURE COMPENSATED OUTPUT SIGNAL IN AN OPTICAL CURRENT MEASURING SENSOR

PUBLICATION-DATE: January 3, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
MENKE, PETER	ERLANGEN		DE	

US-CL-CURRENT: 324/96

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 7. Document ID: US 20010035749 A1

L2: Entry 7 of 33 File: PGPB Nov 1, 2001

PGPUB-DOCUMENT-NUMBER: 20010035749
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20010035749 A1

TITLE: Position transducer

PUBLICATION-DATE: November 1, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Nekado, Yasuo	Kanagawa		JP	

US-CL-CURRENT: 324/207.15; 324/207.22, 324/207.24

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 8. Document ID: US 20010033222 A1

L2: Entry 8 of 33 File: PGPB Oct 25, 2001

PGPUB-DOCUMENT-NUMBER: 20010033222
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20010033222 A1

TITLE: Passive keyless entry system

PUBLICATION-DATE: October 25, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Nowottnick, Juergen	Hamburg		DE	
Boeh, Frank	Hamburg		DE	

US-CL-CURRENT: 340/5.61; 340/5.72

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 9. Document ID: US 6831749 B2

L2: Entry 9 of 33 File: USPT Dec 14, 2004

US-PAT-NO: 6831749
DOCUMENT-IDENTIFIER: US 6831749 B2

TITLE: Sagnac interferometer current sensor

DATE-ISSUED: December 14, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ohno; Aritaka	Tokyo			JP
Usui; Ryuji	Tokyo			JP
Terai; Kiyohisa	Kanagawa			JP
Takahashi; Masao	Kanagawa			JP

Sasaki; Kinichi	Kanagawa	JP

US-CL-CURRENT: 356/483

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 10. Document ID: US 6808699 B2

L2: Entry 10 of 33 File: USPT Oct 26, 2004

US-PAT-NO: 6808699
DOCUMENT-IDENTIFIER: US 6808699 B2

TITLE: Methods for imaging pulmonary and cardiac vasculature and evaluating blood flow using dissolved polarized 129Xe

DATE-ISSUED: October 26, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Driehuys; Bastiaan	Durham	NC		
Hasson; Kenton Christopher	Charlottesville	VA		
Bogorad; Paul Lev	New York	NY		

US-CL-CURRENT: 424/9.36; 424/9.1, 424/9.3, 424/9.32, 534/7

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 11. Document ID: US 6747545 B2

L2: Entry 11 of 33 File: USPT Jun 8, 2004

US-PAT-NO: 6747545
DOCUMENT-IDENTIFIER: US 6747545 B2

TITLE: Passive keyless entry system

DATE-ISSUED: June 8, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Nowottnick; Juergen	Hamburg			DE
Boeh; Frank	Hamburg			DE

US-CL-CURRENT: 340/5.61; 340/5.7

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 12. Document ID: US 6591664 B2

L2: Entry 12 of 33 File: USPT Jul 15, 2003

US-PAT-NO: 6591664
DOCUMENT-IDENTIFIER: US 6591664 B2
**** See image for Certificate of Correction ****

TITLE: Method and arrangement for measuring characteristics of a non-newtonian fluid

DATE-ISSUED: July 15, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Litton; Jan-Eric	Stockholm			SE

US-CL-CURRENT: 73/54.41; 73/54.01, 73/54.27

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 13. Document ID: US 6549003 B2

L2: Entry 13 of 33 File: USPT Apr 15, 2003

US-PAT-NO: 6549003
DOCUMENT-IDENTIFIER: US 6549003 B2

TITLE: Position detector utilizing two magnetic field sensors and a scale

DATE-ISSUED: April 15, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Nekado; Yasuo	Kanagawa			JP

US-CL-CURRENT: 324/207.15

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 14. Document ID: US 6265862 B1

L2: Entry 14 of 33 File: USPT Jul 24, 2001

US-PAT-NO: 6265862
DOCUMENT-IDENTIFIER: US 6265862 B1

TITLE: Process for standardising the intensity of optical sensors used for measuring periodically oscillating electric or magnetic field intensities

DATE-ISSUED: July 24, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Menke; Peter	Erlangen			DE

US-CL-CURRENT: 324/96; 324/117R

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 15. Document ID: US 6218675 B1

L2: Entry 15 of 33 File: USPT Apr 17, 2001

US-PAT-NO: 6218675
DOCUMENT-IDENTIFIER: US 6218675 B1

TITLE: Charged particle beam irradiation apparatus

DATE-ISSUED: April 17, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Akiyama; Hiroshi	Hitachi			JP
Hiramoto; Kazuo	Hitachiota			JP
Matsuda; Koji	Hitachi			JP
Norimine; Tetsuro	Hitachi			JP

US-CL-CURRENT: 250/492.3; 250/396ML, 250/397, 250/398

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 16. Document ID: US 6059718 A

L2: Entry 16 of 33 File: USPT May 9, 2000

US-PAT-NO: 6059718
DOCUMENT-IDENTIFIER: US 6059718 A

TITLE: Endoscope form detecting apparatus in which coil is fixedly mounted by insulating member so that form is not deformed within endoscope

DATE-ISSUED: May 9, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Taniguchi; Akira	Hashioji			JP
Uchimura; Sumihiro	Sagamihara			JP
Ishii; Tsukasa	Hachioji			JP
Hara; Masanao	Tama			JP
Matsuura; Nobuyuki	Hino			JP

Miyano; Yasuo	Hachioji	JP

US-CL-CURRENT: 600/117; 600/424

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KMC | Draw D

17. Document ID: US 5840024 A

L2: Entry 17 of 33 File: USPT Nov 24, 1998

US-PAT-NO: 5840024
DOCUMENT-IDENTIFIER: US 5840024 A

TITLE: Endoscope form detecting apparatus in which coil is fixedly mounted by insulating member so that form is not deformed within endoscope

DATE-ISSUED: November 24, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Taniguchi; Akira	Hachioji			JP
Matsuura; Nobuyuki	Hino			JP
Miyano; Yasuo	Hachioji			JP

US-CL-CURRENT: 600/424

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KMC | Draw D

18. Document ID: US 5661410 A

L2: Entry 18 of 33 File: USPT Aug 26, 1997

US-PAT-NO: 5661410
DOCUMENT-IDENTIFIER: US 5661410 A

TITLE: Method and apparatus for the detection of the current distribution in a conductor of an electric machine

DATE-ISSUED: August 26, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Haldemann; Johann	Birr			CH

US-CL-CURRENT: 324/772; 327/127, 327/545

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KMC | Draw D

☐ 19. Document ID: US 5526022 A

L2: Entry 19 of 33 File: USPT Jun 11, 1996

US-PAT-NO: 5526022
DOCUMENT-IDENTIFIER: US 5526022 A

TITLE: Sourceless orientation sensor

DATE-ISSUED: June 11, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Donahue; Michael J.	San Francisco	CA		
Pesce; Mark D.	San Francisco	CA		
de Groot; Marc	San Francisco	CA		
Perry; Michael A.	Oakland	CA		
Drumm; Donald E.	Billerica	MA		

US-CL-CURRENT: 345/156; 324/253

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KMC | Draw D

☐ 20. Document ID: US 5378987 A

L2: Entry 20 of 33 File: USPT Jan 3, 1995

US-PAT-NO: 5378987
DOCUMENT-IDENTIFIER: US 5378987 A

TITLE: Method and apparatus for non-invasive measurement of temperature distribution within target body using nuclear magnetic resonance imaging

DATE-ISSUED: January 3, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ishihara; Yasutoshi	Kanagawa			JP
Sato; Kozo	Kanagawa			JP

US-CL-CURRENT: 324/315; 600/412

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KMC | Draw D

☐ 21. Document ID: US 5119028 A

L2: Entry 21 of 33 File: USPT Jun 2, 1992

US-PAT-NO: 5119028
DOCUMENT-IDENTIFIER: US 5119028 A

** See image for Certificate of Correction **

TITLE: Method and system for determining the depth of an electrically conductive body in a medium having a known conductivity and a known permeability by measuring phase difference between a primary and secondary magnetic field

DATE-ISSUED: June 2, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Mooney; John J.	Bethpage	NY		
Witt; Christopher J.	Laurel Hollow	NY		
Mohr; Michael T.	New Port Richey	FL		

US-CL-CURRENT: 324/326; 324/233, 324/329, 324/330, 324/334

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 22. Document ID: US 4891587 A

L2: Entry 22 of 33 File: USPT Jan 2, 1990

US-PAT-NO: 4891587
DOCUMENT-IDENTIFIER: US 4891587 A

TITLE: Magnetic field sensor using variations in ultrasound to determine magnetic field

DATE-ISSUED: January 2, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Squire; Patrick T.	Bradford-on-Avon			GB2

US-CL-CURRENT: 324/244; 324/260

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 23. Document ID: US 4849698 A

L2: Entry 23 of 33 File: USPT Jul 18, 1989

US-PAT-NO: 4849698
DOCUMENT-IDENTIFIER: US 4849698 A

TITLE: Method of reducing MR image artefacts in off-center images

DATE-ISSUED: July 18, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Van Der Meulen; Peter	Eindhoven			NL
Van Liere; Filips	Eindhoven			NL

US-CL-CURRENT: 324/309

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 24. Document ID: US 4733938 A

L2: Entry 24 of 33 File: USPT Mar 29, 1988

US-PAT-NO: 4733938
DOCUMENT-IDENTIFIER: US 4733938 A

TITLE: Magneto-optic rotator

DATE-ISSUED: March 29, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lefevre; Herve C.	Palo Alto	CA		
Bergh; Ralph A.	Palo Alto	CA		

US-CL-CURRENT: 385/4; 324/244, 324/244.1, 356/483, 385/11, 385/12, 385/30, 385/41

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 25. Document ID: US 4615582 A

L2: Entry 25 of 33 File: USPT Oct 7, 1986

US-PAT-NO: 4615582
DOCUMENT-IDENTIFIER: US 4615582 A

TITLE: Magneto-optic rotator for providing additive Faraday rotations in a loop of optical fiber

DATE-ISSUED: October 7, 1986

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lefevre; Herve C.	Palo Alto	CA		
Bergh; Ralph A.	Palo Alto	CA		

US-CL-CURRENT: 385/4; 324/244, 324/244.1, 356/483, 385/12, 385/30, 385/41

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 26. Document ID: JP 02063434 A

L2: Entry 26 of 33 File: JPAB Mar 2, 1990

PUB-NO: JP402063434A
DOCUMENT-IDENTIFIER: JP 02063434 A
TITLE: MAGNETIC RESONANCE IMAGING METHOD

PUBN-DATE: March 2, 1990

INVENTOR-INFORMATION:

NAME	COUNTRY
HANAWA, MASATOSHI	

INT-CL (IPC): A61B 5/055; G01R 33/48

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 27. Document ID: EP 646807 A1

L2: Entry 27 of 33 File: EPAB Apr 5, 1995

PUB-NO: EP000646807A1
DOCUMENT-IDENTIFIER: EP 646807 A1
TITLE: MR imaging apparatus.

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 28. Document ID: US 5119028 A

L2: Entry 28 of 33 File: DWPI Jun 2, 1992

DERWENT-ACC-NO: 1992-208355
DERWENT-WEEK: 199225

TITLE: Method for determining depth of electrically conductive body in medium - having known conductivity and known permeability by measuring phase difference between primary and secondary magnetic field

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 29. Document ID: EP 262879 A, DE 3783992 G, EP 262879 B1, GB 2195452 A, GB 2195452 B, US 4891587 A

L2: Entry 29 of 33 File: DWPI Apr 6, 1988

DERWENT-ACC-NO: 1988-093358
DERWENT-WEEK: 198814

TITLE: Magnetic field sensor for small magnetic fields - has body of amorphous magnetic material and ultrasound propagation medium with propagation detector

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 30. Document ID: EP 253446 A, JP 2966845 B2, NL 8601845 A, CN 8705723 A, CA 1256165 A, US 4849698 A, EP 253446 B, DE 3769532 G

L2: Entry 30 of 33 File: DWPI Jan 20, 1988

DERWENT-ACC-NO: 1988-015814
DERWENT-WEEK: 199950

TITLE: Determining nuclear magnetisation distribution from NMR signals - eliminating effect of current interference signals which give rise to image artifacts in off-centre imaging

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 31. Document ID: US 3260926 A

L2: Entry 31 of 33 File: USOC Jul 12, 1966

US-PAT-NO: 3260926
DOCUMENT-IDENTIFIER: US 3260926 A

TITLE: Magnetic field measurement method and apparatus

DATE-ISSUED: July 12, 1966

INVENTOR-NAME: COLES BARRY A

US-CL-CURRENT: 324/322; 324/310

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 32. Document ID: US 3230380 A

L2: Entry 32 of 33 File: USOC Jan 18, 1966

US-PAT-NO: 3230380
DOCUMENT-IDENTIFIER: US 3230380 A

TITLE: Photosensitive polyphase apparatus for detecting and indicating the extent of relative movement

DATE-ISSUED: January 18, 1966

INVENTOR-NAME: REGINALD COOKE CONRAD

US-CL-CURRENT: 356/395; 250/208.6, 250/214.1, 250/237R, 250/550

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw. D

33. Document ID: US 3222593 A

L2: Entry 33 of 33 File: USOC Dec 7, 1965

US-PAT-NO: 3222593
DOCUMENT-IDENTIFIER: US 3222593 A

TITLE: Measuring the characteristics of a magnetic field at any given point by nuclear resonance

DATE-ISSUED: December 7, 1965

INVENTOR-NAME: ANDRE DENIS; GUY RIPART

US-CL-CURRENT: 324/301, 324/318

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw. D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
MAGNETIC	1544664
MAGNETICS	13690
FIELD	3730455
FIELDS	531982
STRENGTH	1822099
STRENGTHS	104847
PHASE	1930020
PHASES	394300
DIFFERENCE	1788773
DIFFERENCES	556945
(L1 AND ((DETERMIN$4 OR CALCULAT$4 OR FIND$3) WITH (MAGNETIC WITH FIELD WITH STRENGTH WITH PHASE WITH DIFFERENCE))).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	33

There are more results than shown above. Click here to view the entire set.

Display Format: - Change Format

L2: Entry 25 of 33 File: USPT Oct 7, 1986

DOCUMENT-IDENTIFIER: US 4615582 A
TITLE: Magneto-optic rotator for providing additive Faraday rotations in a loop of optical fiber

Brief Summary Text (15):
In another application, the present invention may be used as a magnetometer by coupling counter-propagating lightwaves to it. Ambient magnetic fields (such as the earth's magnetic field) will affect the phase of each of the counter-propagating waves as they pass therethrough in the same manner as for the induced magnetic field, described above, and, by measuring the phase difference between these counter-propagating waves, the strength of the magnetic field may be determined.

Detailed Description Text (76):
After the waves W1, W2 have counter-propagated through the magnetic sensor 98, they will be recombined at the coupler 120 to form an optical output signal, designated by the arrow labeled W0. The intensity of this optical output signal W0 is dependent upon the type (e.g., constructive or destructive) and amount of interference of the waves W1, W2, when they are recombined at the coupler 120, which, in turn, is dependent upon the phase difference between the waves W1, W2. Since this phase difference is a function of the strength of the magnetic field 130, the intensity of the optical signal W0 will likewise be a function of the magnetic field strength. Thus, by detecting the optical intensity of this signal W0, the strength of the magnetic field 130 may be determined. It will be understood that the magnetometer may also be utilized as a current sensor by positioning the sensor 98 in the magnetic field of an electrical conductor, preferably with the straight portions 124 parallel to the B-field produced by current through the conductor.

Detailed Description Text (79):
The detector 156 outputs a signal proportional to the intensity of the optical output signal W0, and sends this signal on the line 158 to the lock-in amplifier 160. As previously indicated, the amplifier 160 synchronously detects the detector output signal at the modulation frequency of the modulator 140, so that this amplifier 160 effectively provides a bandpass filter at the fundamental frequency of the modulator 140, blocking all other harmonics of this frequency. This first harmonic of the detector output signal is a sinusoidal function having a magnitude proportional to the phase difference between the waves W1, W2, and therefore, is also a function of the strength of the magnetic field inducing such phase difference. The amplifier 140 outputs a signal, which is proportional to this first harmonic component, and thus provides a direct indication of the strength of the magnetic field, which may be visually displayed on the display panel 170. Further details of this detection system for synchronously detecting the optical output signal are provided in copending patent application, Ser. No. 319,311, still pending, filed on the same date as this application, entitled "FIBER OPTIC ROTATION SENSOR", which is a continuation in part of patent application, Ser. No. 307,095, filed Sept. 30, 1981 (now abandoned), which in turn is a continuation in part of U.S. Pat. No. 4,410,275, issued Oct. 18, 1983 on application, Ser. No. 249,714, now U.S. Pat. No. 4,410,275 filed Mar. 30, 1981, and is assigned to the assignee of the present invention.

CLAIMS:

54. An optical polarization rotator comprising:

a loop of fiber optic material for guiding a lightwave, said loop positioned within a magnetic field with a component of the B field of said magnetic field generally parallel to first and second portions of said loop to cause the polarization of said lightwave to be rotated in said first and second portions;

means for changing the direction of polarization, as said lightwave propagates from said first portion to said second portion, to cause the magnetic field induced polarization in said second portion to add to that in said first portion;

means for coupling substantially circularly polarized counterpropagating lightwaves to said fiber optic loop, said magnetic field advancing the phase of one of said lightwaves while retarding the phase of the other;

means for combining said counterpropagating lightwaves after they have traversed said loop; and

means for detecting the phase difference between said lightwaves that is induced by said magnetic field, to measure the strength of said magnetic field.

Previous Doc Next Doc Go to Doc#

Hit List

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 10 of 10 returned.

☐ 1. Document ID: US 20040164737 A1

Using default format because multiple data bases are involved.

L3: Entry 1 of 10 File: PGPB Aug 26, 2004

PGPUB-DOCUMENT-NUMBER: 20040164737
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040164737 A1

TITLE: Method for determining the B1 field strength in MR measurements

PUBLICATION-DATE: August 26, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Feiweier, Thorsten	Poxdorf		DE	

US-CL-CURRENT: 324/309; 324/318

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. D

☐ 2. Document ID: US 20030152516 A1

L3: Entry 2 of 10 File: PGPB Aug 14, 2003

PGPUB-DOCUMENT-NUMBER: 20030152516
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030152516 A1

TITLE: Methods for imaging pulmonary and cardiac vasculature and evaluating blood flow using dissolved polarized 129Xe

PUBLICATION-DATE: August 14, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Driehuys, Bastiaan	Durham	NC	US	
Hasson, Kenton Christopher	Charlottesville	VA	US	
Bogorad, Paul Lev	New York	NY	US	

US-CL-CURRENT: 424/9.3

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 6808699 B2

L3: Entry 3 of 10 File: USPT Oct 26, 2004

US-PAT-NO: 6808699
DOCUMENT-IDENTIFIER: US 6808699 B2

TITLE: Methods for imaging pulmonary and cardiac vasculature and evaluating blood flow using dissolved polarized 129Xe

DATE-ISSUED: October 26, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Driehuys; Bastiaan	Durham	NC		
Hasson; Kenton Christopher	Charlottesville	VA		
Bogorad; Paul Lev	New York	NY		

US-CL-CURRENT: 424/9.36; 424/9.1, 424/9.3, 424/9.32, 534/7

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 4. Document ID: US 5378987 A

L3: Entry 4 of 10 File: USPT Jan 3, 1995

US-PAT-NO: 5378987
DOCUMENT-IDENTIFIER: US 5378987 A

TITLE: Method and apparatus for non-invasive measurement of temperature distribution within target body using nuclear magnetic resonance imaging

DATE-ISSUED: January 3, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ishihara; Yasutoshi	Kanagawa			JP
Sato; Kozo	Kanagawa			JP

US-CL-CURRENT: 324/315; 600/412

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw D

☐ 5. Document ID: US 4849698 A

L3: Entry 5 of 10 File: USPT Jul 18, 1989

US-PAT-NO: 4849698
DOCUMENT-IDENTIFIER: US 4849698 A

TITLE: Method of reducing MR image artefacts in off-center images

DATE-ISSUED: July 18, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Van Der Meulen; Peter	Eindhoven			NL
Van Liere; Filips	Eindhoven			NL

US-CL-CURRENT: 324/309

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 6. Document ID: JP 02063434 A

L3: Entry 6 of 10 File: JPAB Mar 2, 1990

PUB-NO: JP402063434A
DOCUMENT-IDENTIFIER: JP 02063434 A
TITLE: MAGNETIC RESONANCE IMAGING METHOD

PUBN-DATE: March 2, 1990

INVENTOR-INFORMATION:

NAME	COUNTRY
HANAWA, MASATOSHI	

INT-CL (IPC): A61B 5/055; G01R 33/48

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 7. Document ID: EP 646807 A1

L3: Entry 7 of 10 File: EPAB Apr 5, 1995

PUB-NO: EP000646807A1
DOCUMENT-IDENTIFIER: EP 646807 A1
TITLE: MR imaging apparatus.

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 8. Document ID: EP 253446 A, JP 2966845 B2, NL 8601845 A, CN 8705723 A, CA 1256165 A, US 4849698 A, EP 253446 B, DE 3769532 G

L3: Entry 8 of 10 File: DWPI Jan 20, 1988

DERWENT-ACC-NO: 1988-015814
DERWENT-WEEK: 199950

TITLE: Determining nuclear magnetisation distribution from NMR signals - eliminating effect of current interference signals which give rise to image artifacts in off-centre imaging

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 9. Document ID: US 3260926 A

L3: Entry 9 of 10 File: USOC Jul 12, 1966

US-PAT-NO: 3260926
DOCUMENT-IDENTIFIER: US 3260926 A

TITLE: Magnetic field measurement method and apparatus

DATE-ISSUED: July 12, 1966

INVENTOR-NAME: COLES BARRY A

US-CL-CURRENT: 324/322; 324/310

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 10. Document ID: US 3222593 A

L3: Entry 10 of 10 File: USOC Dec 7, 1965

US-PAT-NO: 3222593
DOCUMENT-IDENTIFIER: US 3222593 A

TITLE: Measuring the characteristics of a magnetic field at any given point by nuclear resonance

DATE-ISSUED: December 7, 1965

INVENTOR-NAME: ANDRE DENIS; GUY RIPART

US-CL-CURRENT: 324/301, 324/318

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
MAGNETIC	1544664

MAGNETICS	13690
RESONANCE	309525
RESONANCES	18109
MRI	29860
MRIS	429
NMR	153411
NMRS	260
(2 AND (MRI OR (MAGNETIC ADJ RESONANCE) OR NMR)).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	10
(L2 AND ((MAGNETIC ADJ RESONANCE) OR MRI OR NMR)).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	10

Display Format: - Change Format

Previous Page   Next Page   Go to Doc#

First Hit Previous Doc Next Doc Go to Doc#
End of Result Set

Generate Collection Print

L3: Entry 10 of 10 File: USOC Dec 7, 1965

DOCUMENT-IDENTIFIER: US 3222593 A
TITLE: Measuring the characteristics of a magnetic field at any given point by nuclear resonance

OCR Scanned Text (2):
United States Patent Office, 312229593 3,222,593 @ TICS OF A MEASURING THE CHARACTEM MAGNETIC FIELD AT ANY GIVEN POINT BY NUCLEAR RESONANCE Andr6 Denis, Herblay, and Guy Ripart, Plessis- Robinson, 5 France, assignors to Sud-Aviation Soci6t6 Nationale de Constructions A6ronautiques, Paris, France Filed July 13, 1962, Ser. No. 209,540 Claims priority, application France, July 13, 1961, 867,872; Patent 1,303,505 10 5 Claims. (Cl. 324-.5) This invention relates to improvements for measuring, by nuclear resonance, such characteristics of a magnetic field as its absolute magnitude or its variations at any given point. 15 Such determinations are usually based on the frequency at the middle of an intense and narrow nuclear n- lagnetic resonance line. As is well known, the frequency F, or the Larmor precession frequency, of a nuclear spin placed in a magnetic field H is related to the latter by the 20 equation: F=,yH (1) K where y is a coefficient characterizing the nuclear spin 25 the resonance of which is being observed, said coefficient being known with great accuracy and being termed the gyromagnetic ratio of the proton. In conventional apparatus used for such determinations, an exploration sample consisting of a volume of liquid 30 containing the nuclei of which the nuclear resonance is to be observed is disposed within the coil of a resonant circuit placed in the magnetic field to be rneasured, said sample being subjected to a field of high frequency tuned to the electronic resonance frequency of the substance, 3 5 with a view to obtaining a very fine line of great amplitude representing the energy by the corresponding nuclear spins into the surrounding magnetic field. This phenomenon is known as the Overhauser effect. In order to obtain a relatively strong continuous signal 40 of frequency eqtial to that of the resonance defined by Formula (1), recourse has already been had to a resonant circuit having a very high overvoltage coefficient. The impossibility in practice of exceeding certain limits has led experimenters to artificially increase the overvoltage 4 5 of this circuit by a positive feedback, by means of an amplifier. However, this artifice has the dual disadvan- tage of making it difficult to proportion the feedback and also of causing a frequency drift when a slig'@it misrnatch- ing exists between the nuclear resonance frequency and 50 the frequency of the resonant circuit. With a view to overcoming these drawbacks, this inven- tion has for an object to provide apparatus for determin- ing, by nuclear resonance, the characteristics of a mag- netic field at any given point, by injecting a signal of 55 adjustable frequency close to that of the natural signal of the oscillating circuit into a selective oscillating circuit disposed at said point and excited by nuclei subjected to the Overhauser effect, generating a current wmch is a function of the phase shift between these two signals, ad- 60 justing said adjustable frequency by said current with a view to cancelling the dift'erence between said two fre- quencies in order to increase the intensity of the emission from said oscillating circuit, and determining separately or not, the absolute magnitude and the variations of said 65 field at said points, respectively by measuring the fre- quency of said emission, which is then equal to the Larmor precession frequency of said nuclei and consequently pro- portional to said

absolute magnitude, and by studying 70 the variations of said current, which are proportional to the variations of said field. Patented Diec. 7, 1965 2 In accordance with one specific embodiment of apparatus accordina to the invention, said adjustable frequency is feedback controlled by the nuclear resonance frequency of the nuclei. In accordance with another form of embodiment of the i- @ivention, a measurement is made of the voltage of the signals emitted by said oscillating circuit, said voltage following the amplitude fluctuations of thp nuclear magnetic resonance line of said nuclei. It is a further object of this invention to provide an apparatus for measuring the characteristics of a rnagnetic field at a given point, whereby the operation disclosed hereinabo-,re may be carried into practice, said apparatus being of the type comprising a probe which consists, in the manner well known per se, of a sample containing nuclei subjected to the Overhauser effect and disposed within the coil of a selective or LC oscillating circuit, characterized in that said probe is loosely coupled to an adjustable frequency oscillator which is connected, together with said oscillating circuit, to a phase discriminator, the apparatus further comprising rneans sensitive to the output current from said discriminator to so vary the frequency of said oscillator to tend to cancel the difference between said frequency and the Larmor precession freqtiency of said nuclei, said apparatus further comprising either a freqliency meter connected to the probe output, or a voltmeter connected to the output of said probe, or a device for analysing said current, or several or all of these instruments at once. The adjustable frequency oscillator is preferably a selfoscillator feedback controlled by the direct current furnished by the phase discriminator. The description which follows with reference to the accompanying drawings, which are ffled by way of example and not of limitation, will give a clear understanding of how the invention may be carried into practice and will disclose yet further particularities thereo'L In the drawings: FIG. 1 represents a conventional selective oscillating circuit. FIG. 2 schematically shows the curve @obtained when the output voltage from the selective oscillating circuit of FIG. I is plotted against the input frequency into said circuit. FIG. 3 is the wiring diagram of a probe for studying the magnetic field by nuclear resonance, said probe being associated to the selective circuit of FIG 1. FIG. 4 schematically shows the curve of voltage plotted against frequency, in the case of the probe of FIG. 3. FIG. 5 is the wiring diagram of a device for measuring the characteristics of a magnetic field by nuclear resonance in accordance with this invention, said device being equippe d with a voltmeter for studying amplitude variations in the nuclear resonance line. FIGS. 6 and 7 illustrate portions of the device shown in FIG. 5, which portions are respectively equipped wi a frequency meter for measuring the nuclear resonance frequency and with an ammeter for studying variations in the current through the slaving circuit. Referring now to FIG. 1, if the selective or LC circuit schematically illustrated thereon by a self-induction coil L and a capacitor C be energized through a coupling impedance z acting as a weakly coupling means, then a four-pole system, having input terminals I and 2 and output terminals 3 and 4, will be- constituted. When the frequency f across the input terminals I and 2 varies, the four-pole system output voltage p, will vary in obedience to a law which is illustrated schematically in FIG. 2 and which characterizes the pass-band fl--7f2of the selective circuit in FIG. 1. If now, as shown in FIG. 3, there is introduced into the coil L of FIG. I a vessel 5 containing water which is

OCR Scanned Text (3):
3 doped or not with a paramagnetic silbstance, and if, furthermore, this water is subjected to a high frequency field which is tuned to the electronic resonance freque-@ley of the said paramagnetic substance or of the nondoped water and wliieh is obtained by a generator 6 energizincoils 7 set perpendicularly across both the self-induction coil L and the magnetic field H vihich is perpendicular to the plane of the figure, it will be found that the output voltage A' of the folr-pole system can be re?)reser@ted by the curve in FIG. 4. For a given value F of the inptit frequency given by Equation (1), a very flie line of large amplitude appears, corresponding to an emission of energy into the surrounding magnetic field H by the nuclear spins of ihe water, known as the Overhauser-A@bra.- am effect. The LC

circuit gives the phase coherency for the signals delivered by the proton probe illustrated in FIG. 3. If the phases of the input and output volta.-es of the four-pole system of FIG. 3 be compared when the supply input frequency f varies about the nuclear resonance frequency F, then, as a first approximation, the phase difference p will vary linearly with said input frequency f, so that if the origin be correctly chosen, one may write: p=A (f -F) (2) where A is a constant. It is of tWs -specific property that advantage is taken in the present invention for executing a practical apparatus whereby the nuclear frequencies F may be measui-ed and, on the basis thereof, the ambient magnetic fields ascertained from relation (1). This phase difference is converted by means of a phase discriminator into a direct current the value of @vhich is proportional to said difference, and the direct current produced in this manner is used to so control the frequency of auxiliary signals delivered by an adjustable frequency self-oscillator that said frequency be made by natural drift to coincide with Larmor's frequency F and that automatic lock-on be ensured in the event of a deviation therefrom. To this end, @and as is clearly represented in FIG. 5, the apparatus for measuring the characteristics of a magnetic field at a given point by nuclear resonance comprises a prabe 8 consisting of the selective eircliit ol FIG. 3, the component parts of which circuit bear the same reference numerals -as those used in FIG. 3 followed by the subscript a, while a self-oscillator 9 of adjustable frequency has its output connected to the input terminals la and 2a of said probe in órder to submit the LC circuit to a constrained oscillatio-n. Said adjustable frequency self-oscillator is equipped with a value V and with a resonant element comprising a self-induction coil LI with a saturatable core 10 and a saturation winding 11, in conjunction with an adjustable tuning capacitor Cl. The apparatus further comprises a low-noise-level amplifier 12 connected to the outputs 3a and 4a of probe 8 and a phase @discriminator 13 into which are injected the output voltage from said amplifier 12 throu.-h the terminals 14 and 15 and the output voltage from self-oscillator 9 through the terminals 16 and 17. The output terminals 18 and 19 of said phase discriminator are connected to the- saturation winding 11 of self- oscillator 9. In such an oscillator, or other equivalent oscillator, the generated frequency f varies in terms of the direct current i delivered by the phase discriminator 13 and flowing through the element 11 or its equivalent; in fact, the self-oscillator 9 is feedback controlled by said D.C. The truth of the reasoning which follows is in no way invalidated by assuming that such variations are, as a first approximation, linear over a limited range and take the form: f=fo+Bi (3) where fo is the natural frequency of the oscillating circuit LIC, and B is a constant. The phase discriminato@- 13, as is w@-11 known, supplies ,icross its output teriuinals IS tnd 19 a direct ctirrerit 3,222,593 4 which is a function of the phase difference existing between voltages injected through 14-15 and throu.-h 16-17 respectively. Again in the interest of clarity, it will be assumed that this relation is linear, at any rate over a certain range. One may, therefore, write: i=cp (4) where C is a constant. The con-ibiiiiation of relations (2,), (3) and (4) gives: f-fo=BCA(f-F) or f -fo f -F= ABC (5) where A, B, C are constants stemming ftom the size of the apparatus and B and C in particular can be made very large. Since the value (f-fo) is necessarily finite, it may be seen that the value (f-F) can be made as small as de- sired until the followin.- equality is obtained. f=F (6) This equality is achieved automatically by the apparatus according to this invention, regardless of whether F varies subsequently for any reason. In this way there are provided, at the output of amplifier 12, signals the freque- iicy oi which is the same as that of the resc)nance line, and this frequency will follow, without any need for adjustment, such variations in said nuclear resonance frequency as are caused by the variations, rapid though they may be, of the magnetic field H to be measured. It is easy, therefore, to appreciate both the aim and the usefulness of the present invention, which consists in pro- viding an adjustable frequency apparatus that is caused to lock onto the nuclear <u>magnetic resonance</u> frequency. It will easily be seen that the various relations given hereinabove will be valid on y over a fairly imited quency range and that the automatic lock-on will operate correctly only if the system has first been approximated to a sufficient degree. For this reason, provis:lon is made for the self-oscillator 9 to be tunable by means of the

adjustable capacitor Cl. Such tuning can be carried out nianually, in approximate fashion, to within 4 cycles, say. To this end, the voltmeter V connected across terrpinals 14 and 15 is kept under obsei-vation. As soon as the approximate frequency f,, enters the regulation ran.-e of discriminator 13, the frequency jumps automatically to the freqtiency F and the readina given by voltmeter V immediately shows a substantial increase. Thencei.Orward, if the nucl--ar magnetic resonance frequency F varies as a function of some variation in the magn-.tic field, the apparatus hereinbefore described ensures that the output frequency from amplifier 12 remains eqijal to this varying frequency. The apparatus as illustrated in FIG. 5 can be operated in either of the three followin- different ways: (a) As shown i-@i FIG. 6, a frequency meter 20 is connected across the terminals of amplifier 12 and said fre- quency meter indicates the output frequency of said amplifier, i.e. the nuclear magnetic resonance or Larmor precession frequency of the nuclei utilized, on the basis of which frequency the absolute magnitude of.the magnetic field H can be determined with th-- desired de.-ree of ac- curacy by applying the relation (1). (b) From readings on the voltmeter V of FIG. 5 or from- recordings on a recording device utilized in lieu thereof, a study is made of the voltage fluctuations across the output tern-iinals of amplifier 12, with a v:@ew to fol- lowing the ampl@itude variations in the nuclear resonance line. (c) From direct readings, or from recordings by means of an instrument 21 such as an ammeter inserted into the slaving circuit (see FIG. 7), a study is made of tho cur- rent i whiqh flows across tern-iinals 18 and 19 of phase dis-

OCR Scanned Text (4):
criminator 13 and wbich represents a cbaracteristic feature of the variance in the magnet,',e field H, the fluctuations in said current flow providing an indication which remains proportional to the fluctuations in said magnetic field into wbich the probe is placed, which ind@@cation is utilized for detectin.- said fluctuations. This latter method of operation can be further improved by introducing into the feedback-controlling circuil. which connects the phase discriminator 13 and the saturation winding 11 a circuit 22 having an ap . preciable time-cbitstant. With such an arrangement, slow changes in the magnetic field H will produce variations in the current i that are likewise slow. Conversely, any rapid variation in said field will generate a very strong si,-nal wbich the continuous recording process accomplished by the device 21 will detect immediately. It is to be noted that the method and apparatus according to this invention allow for the use of a low frequency source that does not call for any special stability conditions for the obtainment of a nuclear resonance line capable of following the variations, rapid notwitbstanding, of the magnetic field to be measured, without the need for manual adjustment. The measurement of said ma.-netic field can consequently be accomplished with very great accuracy by measuring the frequency of the output signal from the low-noise-level amplifier, without causing any frequency drift. What we claim is: 1. In an apparatus for measuring the strength of a -magnetic field at a given point, of the type comprising a conventional proton probe consisting of a proton saniple subjected to an Overhauser effect and surrounded by the coil of an L.C. circuit, said coil being weakly coupled to a self-oscillator which is connected to a phase discriminator to which is also connected said self-oscillator by a low-noise level amplifier whereby the - phase discriminator generates a direct current wbich is a function of the pliase difference between the signals delivered by said amplifier and by said oscillator, means connected to said self-ose,'Ilator and to said phase discriminator for feedback controllin.- said self-osc-' Ilator by said direct current to cane,--I said phase difference, and means for measurin,@ the '@@requency of the signals delivered by said amplifier in order to determine the strength of the magnetic field, the improvement accordii@ to which the self-oscillator has a resonant element comprising a saturatable core, a selfinduction coff wound on said core, an adjustabl-- tunin,@ capacitor connected in parallel across said self- induction coil and a saturation windin.- wodnd on said core, the means for feedback controllin.- the self-oscillator comprising a feedback controlling circuit

interconnecting the output of the phase discriminator and said saturation winding, whereby said winding and said c@ircuit act as a feedback control for said self-oscillator. 2. An apparatus according to claim 1, further comprisin- a voltmeter mounted in parallel between the lownoise level amplifier and the pbase discriminator in order to detect the ampiitude variations in the nuclear resonance. 3,222,593 3. An apparatus according to claim 11, further comprising a currenl value sens;tive means mounted in series in the feedback controlling circuit for indicating the variations of the direct current in order to detect the fluctuations of the magnetic field. 4. An apparatus according to claim 3, further comprising a circuit having an appreciabl@e time-constant interconnecting the current value sensitive @-,ieans and the saturation winding, whereby the correction of the self- oscillator frequei-icy is delayed for obtaining a better detection of the ma.-netic field fluctuations.. 5. In an apparatus for meastiring the strength of a magnetic field at a given point, of the type comorisin@ a conventional proton probe consisting of a proto-@i sample sub- jected to an Overhauser effect and surrounded by the coil of an LC circuit; the improvement comprising, in combination, a self-oscillator having a resonant element comprismg a saturatable core, a self-induction coil wound on said core, an adjustable tuning cknacitor connected i,.i parallel across said self-induction coil and a saturation winding wound on said core; a coupling impedance interconnecting the output of said- self-oscillator and the input of the coil of the LC circuit, a low-noise level amplifier connected to the output of the proton @probe, a phase dis- criminator having two inputs respect;vely connected to the outputs of said self-oscillator and of said amplifier for generating a direct current which is a function of the phase difference between the signals delivered by said amplifier and by said oscillator, a feedback controlling cir- cuit interconnectin.@ the output of the phase discriminator and se-,id saturation windin.-, whereby said winding and said circuit act as a feedback control for said self- oscillator; a frequency meter and a voltmeter respectively mounted in parallel between the low-noise level am- plifier and the phase discriminator, an ammeter mounted in series in said feedback controlilng circuit, and a circuit havin- an appreciable time-constant mounted in parallel across said feedback controlling circuit between said ammeter and said saturation @,vinding. References Cited by the Examiner UNITED STATES PATENTS 2,922,947 1/1960 Bloom et al - -------- 324-0.5 3,049,662 8/1962 Abragram et al. 324-0.5 3,103,624 9/1963 Greenwood et al ------ 324-0.5 3,127,556 3/1964 Gielow et al - ---------- 324-5 OTHER REFERENCES Bekeshko et al., The Physics of Metals and Metallography, vol. 6, No. 4, 1958, pages 30- 34 inclusive. Feldman, Review of Scientific Instruments, vol. 3 1, No. 1, January 1960, page 72. Noble et al., Review of Scientific Instruments, vol. 28, No. 11, November 1957, pp. 930-932 incl. Shulman, Physical Review, vol. 12 1, No. 1, Jan. 1, 196 1, article commencing on page 125, pp. 125-128 incl. CHESTER L. JUSTUS, Primary E.Yaminer. IvlAYNARD R. WILBUR, Exan7iner.

Previous Doc Next Doc Go to Doc#